



Illinois Department of Transportation

To: Masood Ahmad Attn: Dave Broviak
From: Jack Elston By: Michael Brand
Subject: Pavement Design Approval
Date: March 23, 2020

Michael Brand

Route: US 6 Job No.: P-93-035-11
Section: (31)N Contract No.: 66B52
County: LaSalle Target Letting: FY21
Limits: Intersection of US 6 & IL 178 North of Utica

The Pavement Selection Committee has reviewed the pavement design for the above referenced project which was most recently submitted on March 10, 2020. The scope of the project involves reconstructing the intersection of US 6 and IL 178 to provide a modern roundabout.

The pavement design resulted in two pavement options: 10" Full-Depth HMA and 9" PCC. The life-cycle cost analysis of those options resulted in the PCC pavement being 5.3% less expensive (\$112,514/mile compared to HMA's cost of \$118,497/mile). In lieu of alternative bidding, the district recommended the PCC option due to the short length of the project, constructability, and volume of heavy trucks making the turning movement. The committee concurred with the district.

In summary, the approved pavement design is as follows:

9 PCC Pavement w/ tied Curb & Gutter
12" Improved Subgrade

If you have any questions, please contact Mike Brand at (217) 782-7651.



Illinois Department of Transportation

Memorandum

To: Jack Elston Attn: Mike Brand
From: Masood Ahmad By: Dave Broviak
Subject: Pavement Design Approval Request *
Date: March 10, 2020

* FAP 623 (US 6)
Section (31)N
LaSalle County
Job No. P-93-035-11
Contract No. 66B52
Intersection of US 6 & IL 178

RECEIVED
MAR 13 2020
BUREAU OF
DESIGN & ENVIRONMENT

Attached for approval is the pavement design for the proposed Modern Single Lane Roundabout at US 6 & IL 178 in North Utica. This submittal has been revised per Lincoln Hill's recommendations. Please review and approve the design which recommends 9 inches of Jointed Plain Concrete Pavement (JPCP). Construction of this project is currently anticipated in FY 2021.

JPCP is the preferred pavement type based on life-cycle cost in the attached analysis. Construction of JPCP has a life-cycle cost 5.3% less than 10 inches of full depth Hot-Mix Asphalt (HMA) pavement. Stabilized subbase was omitted from the JPCP design, which is allowed by policy due to the proposed aggregate subgrade improvement, curb and gutter, and storm sewer throughout the project.

A life-cycle cost difference of 10% or less normally requires pavement selection by alternate bid. The District prefers JPCP for the proposed roundabout due to constructability, durability, and future maintenance concerns with using HMA pavement. HMA pavement is also a concern due to the volume of heavy trucks making constant and slow turning movements in the roundabout. Concrete pavement allows more flexibility in accomplishing the complex staged construction required and is also presumed to reduce the frequency of maintenance activities within the roundabout that would occur with the use of HMA and the resulting disruptions to truck traffic.

The project involves replacing an existing all-way stop intersection (which is currently under temporary traffic control signalization) with a Modern Single Lane Roundabout. The estimated quantity of new pavement is 6,787 square yards. The pavement design was performed according to Chapter 54 of the Bureau of Design & Environment manual, current as of a December 2019 revision. The IDOT Mechanistic Pavement Design and LCCA spreadsheet used is (BDE 5401 - Revision 11/22/2019). Calculations to determine pavement thicknesses and life-cycle costs are attached and electronic files have been emailed for review. The following facts and assumptions were used in the design:

Memo to Jack Elston, Attn: Mike Brand

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March 10, 2020

- Jointed Plain Concrete Pavement constructed with B-6.24 combination curb and gutter on the outer edges of pavement and M-4.12 on the inner splitter islands.
- The truck turning apron areas totaling 613 square yards are included in the estimated new pavement quantity listed above. M-4.24 combination curb and gutter is proposed between the roadway and apron areas.
- Design Traffic was based on US 6 projected data provided by 2017 Traffic Counts projected to 2040.
- Design Period of 20 years.
- Poor sub-grade.
- PG grade 70-28 for top lift of the binder and the surface course.
- PG 64-22 for the lower binder lifts.
- Rubblization and unbonded overlay were not considered because the complications of stage construction and the significant location difference of the roundabout pavement.
- The LCCA spreadsheet is not well suited for a roundabout so user supplied quantities were relied upon for some items; however, the methods used are assumed to provide valid comparisons.
- BDE 54-1.05(a) defines a high-stress intersection as one under stop control. A roundabout operates under yield control; however, the M.U. ADT is greater than 200 vehicles in the design lane. This intersection is considered to be a high-stress location.

If you have any questions, please contact Shaun Dondelinger at (815) 434-8566.

SD:dld

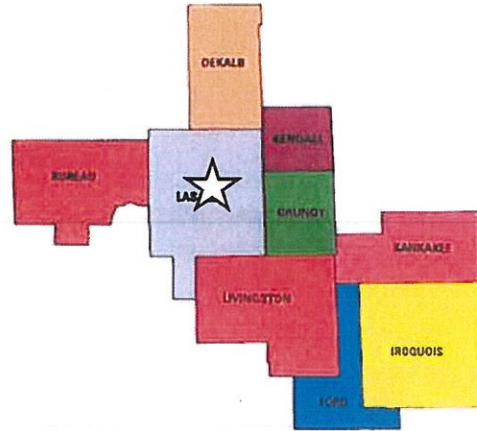
Project Location Map

EAP 623 (US 6)
Section (31)N

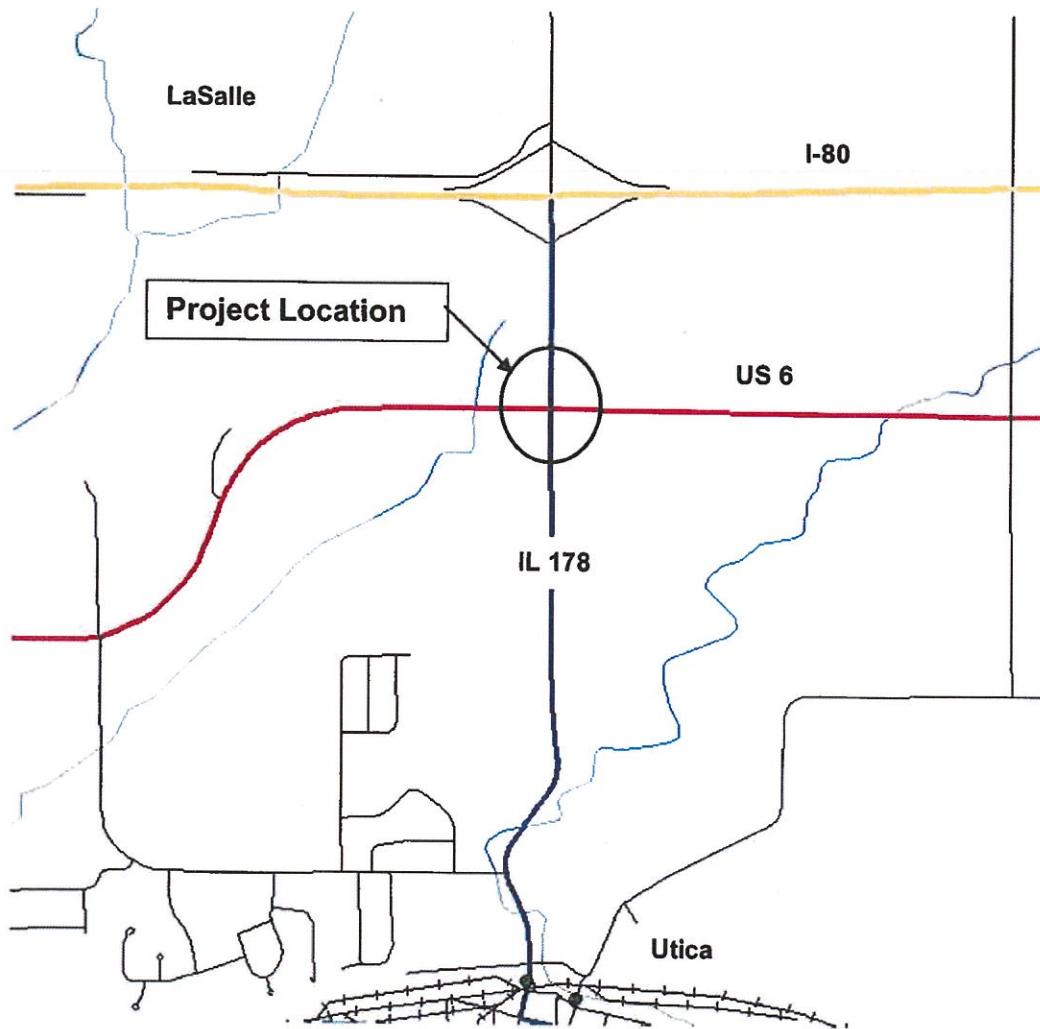
LaSalle County

Intersection with FAS 1279 (IL 178)

Contract #66B52



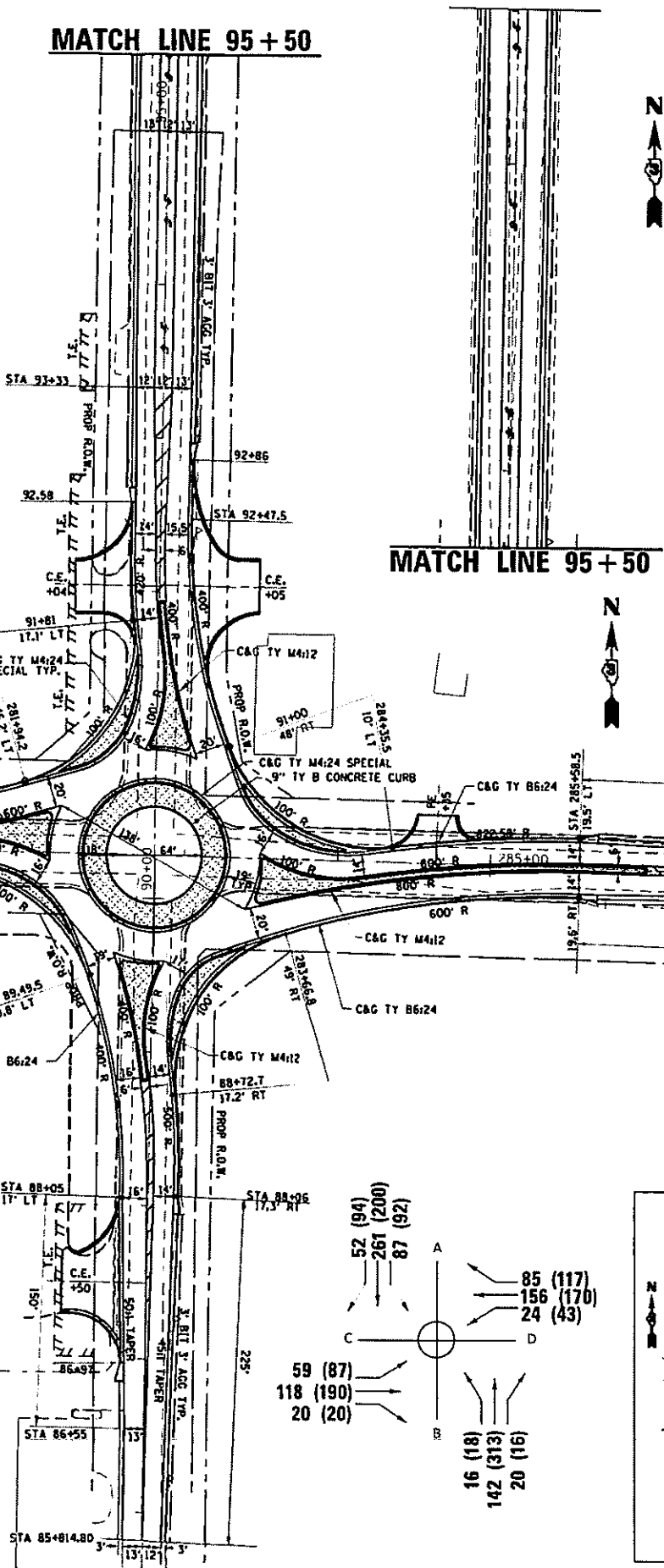
Project Area = ☆



D3# 2736

ROUNDBOUT CAPACITY DESIGN STUDY															
PROGRAM USED		S'DRA		VERSION		8.0		AREA		URBAN		PEAK HOUR FACTOR		A14 0.92 - PM 0.86	
INTERSECTION CONTROL DELAY		A.M.		7.2 SECONDS		P.M.		7.9 SECONDS							
INTERSECTION LEVEL OF SERVICE		A.M.		A		P.M.		A							
APPROACH		SOUTHBOUND			WESTBOUND			NORTHBOUND			EASTBOUND				
LANE GROUP		RT	THRU	LT	RT	THRU	LT	RT	THRU	LT	RT	THRU	LT		
2040 30TH MAX. HOUR TRAFFIC	A.M.	52	261	87	85	156	24	20	142	16	20	118	59		
	P.M.	94	200	92	117	170	43	16	313	18	20	190	87		
ENTRY FLOW RATE V_{pc} (pc/h)	A.M.		384			288			179			240			
	P.M.		351			300			323			359			
PED/HOUR CROSSING THE APPROACH	A.M.	0	0	0	0	0	0	0	0	0	0	0	0		
	P.M.	0	0	0	0	0	0	0	0	0	0	0	0		
LANE MOVEMENTS			LRT			LRT			LRT			LRT			
ENTRY FLOW RATE v_i (vph)	A.M.		384			288			179			240			
	P.M.		351			300			323			359			
LANE CAPACITY c_i (vph)	A.M.		804			722			675			240			
	P.M.		801			641			686			763			
x_i (v/c , RATIO)	A.M.		0.478			0.399			0.266			0.368			
	P.M.		0.438			0.468			0.471			0.470			
STORAGE QUEUE LENGTH (FEET OR VEHICLES)	A.M.		58.7			42.9			25.2			37.5			
	P.M.		51.6			55.7			58.9			59.8			
LANE DELAY, d (SEC)	A.M.		6.8			6.6			6.6			9.1			
	P.M.		7.0			8.3			8.0			8.4			
LANE LEVEL OF SERVICE	A.M.		A			A			A			A			
	P.M.		A			A			A			A			
APPROACH CONTROL DELAY, d (SEC)	A.M.		6.8			6.6			6.6			9.1			
	P.M.		7.0			8.3			8.0			8.4			
APPROACH LEVEL OF SERVICE	A.M.		A			A			A			A			
	P.M.		A			A			A			A			

MATCH LINE 95 + 50



ELEMENTS CONTROLLING DESIGN

PREFERRED ROUTE:
F.A.P. ROUTE NUMBER: 623
STREET NAME: US 6
FUNCTIONAL CLASSIFICATION: MINOR ARTERIAL
EXISTING ADT: 5100 VPD
PROPOSED DESIGN SPEED: 45 MPH.

MARKED ROUTE NUMBER: US 6
SRA ROUTE: NO
OSOW DESIGN: YES
DESIGN YEAR ADT: 6412 VPD
PROPOSED POSTED SPEED: 45 MPH

SECONDARY ROUTE:
F.A.S. ROUTE NUMBER: 1279
STREET NAME: IL 178
FUNCTIONAL CLASSIFICATION:
1. NORTH LEG - OTHER ARTERIAL
2. SOUTH LEG - MAJOR COLLECTOR
EXISTING ADT: 2017 NORTH LEG 7200 SOUTH LEG 4200
PROPOSED DESIGN SPEED: 45 MPH

MARKED ROUTE NUMBER: IL 178
SRA ROUTE: NO
OSOW DESIGN: YES

IMPROVEMENT TYPE: CONSTRUCTION / RECONSTRUCTION / SAFETY
ANTICIPATED YEAR OF CONSTRUCTION: 2020
EXISTING METHOD OF TRAFFIC CONTROL: SIGNALIZED
DESIGN VEHICLE: WB 67
DESIGN YEAR ADT: 2040 NORTH LEG 9052 SOUTH LEG 5280
DESIGN YEAR WHICH IS A 20 YEAR DESIGN.
TRUCK ROUTE CLASS: PREFERRED ROADWAY: CLASS II
SECONDARY ROADWAY: NORTH LEG - CLASS III

DESIGN CRITERIA: ROUNDBOUT

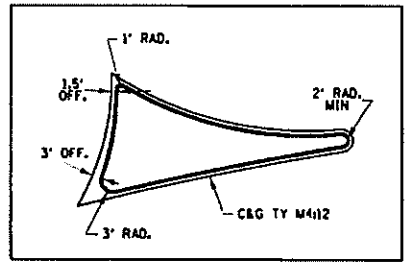
GENERAL NOTES
ARE PROFILES PROVIDED? YES
TYPE B6:24 CURB AND GUTTER ON THE OUTSIDE OF THE ROADWAY/SHOULDERS.
TYPE M4:24 SPECIAL ON THE TRUCK APRON.
TYPE B6 BARRIER CURB ON THE CENTRAL ISLANDS.
TYPE M4:12 CURB AND GUTTER ON THE APPROACH MEDIAN.

ALL DIMENSIONS ARE (E-E, E-F, OR F-F) EDGE TO EDGE, UNLESS OTHERWISE NOTED

THE RIGHT-OF-WAY LIMITS ARE PRELIMINARY.
DESIGN VEHICLE TURNING MOVEMENTS ARE ACCOMMODATE PER TRANSOF AUTOTURN PRO 10.1.
THE SCOPE OF WORK: REMOVAL EXISTING SIGNAL SYSTEM AND CONSTRUCTION OF A MODERN ROUNDBOUT

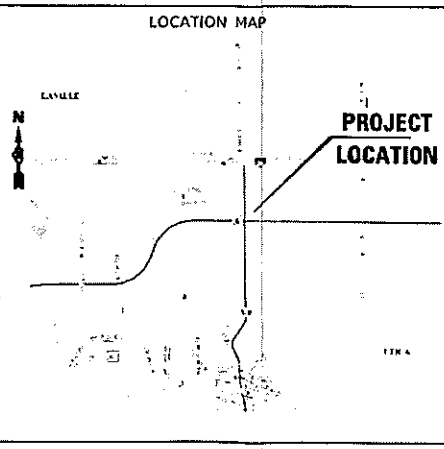
INTERSECTION DESIGN EXCEPTIONS: NONE

ADDITIONAL NOTES:



TRAFFIC DATA											
MOVEMENT	YEAR 2017 30TH MAXIMUM HOUR TRAFFIC		PERCENT TRUCK TRAFFIC IN 30TH MAX HOUR		ESTIMATED PERCENT INCREASE BY 2020	YEAR 2030 30TH MAXIMUM HOUR TRAFFIC		ESTIMATED PERCENT INCREASE BY 2040	YEAR 2040 30TH MAXIMUM HOUR TRAFFIC		
	A.M.	P.M.	A.M.	P.M.		A.M.	P.M.		A.M.	P.M.	
AD (L)	69	73	26	15	13.8	79	83	25.7	87	92	
AB (T)	208	159	10	6	13.8	237	181	25.7	261	200	
AC (R)	41	75	11	19	13.8	47	85	25.7	52	94	
BC (L)	13	14	0	14	13.8	15	16	25.7	16	18	
BA (T)	113	249	17	15	13.8	129	283	25.7	142	313	
BD (R)	16	13	27	15	13.8	18	15	25.7	20	16	
CA (L)	47	69	24	6	13.8	53	79	25.7	59	87	
CD (T)	94	151	6	5	13.8	107	172	25.7	118	190	
CB (R)	16	16	8	13	13.8	18	18	25.7	20	20	
DB (L)	19	34	13	6	13.8	22	39	25.7	24	43	
DC (T)	124	135	7	11	13.8	141	154	25.7	156	170	
DA (R)	68	93	28	24	13.8	77	106	25.7	85	117	
TOTAL A	546	718				621	817		686	903	
TOTAL B	385	485				438	552		484	610	
TOTAL C	335	460				381	524		421	578	
TOTAL D	390	499				444	568		490	627	

T = THROUGH, L = LEFT, R = RIGHT



INTERSECTION DESIGN STUDY

FAP ROUTE 623 WITH US 6
FAS ROUTE 1279 WITH IL 178

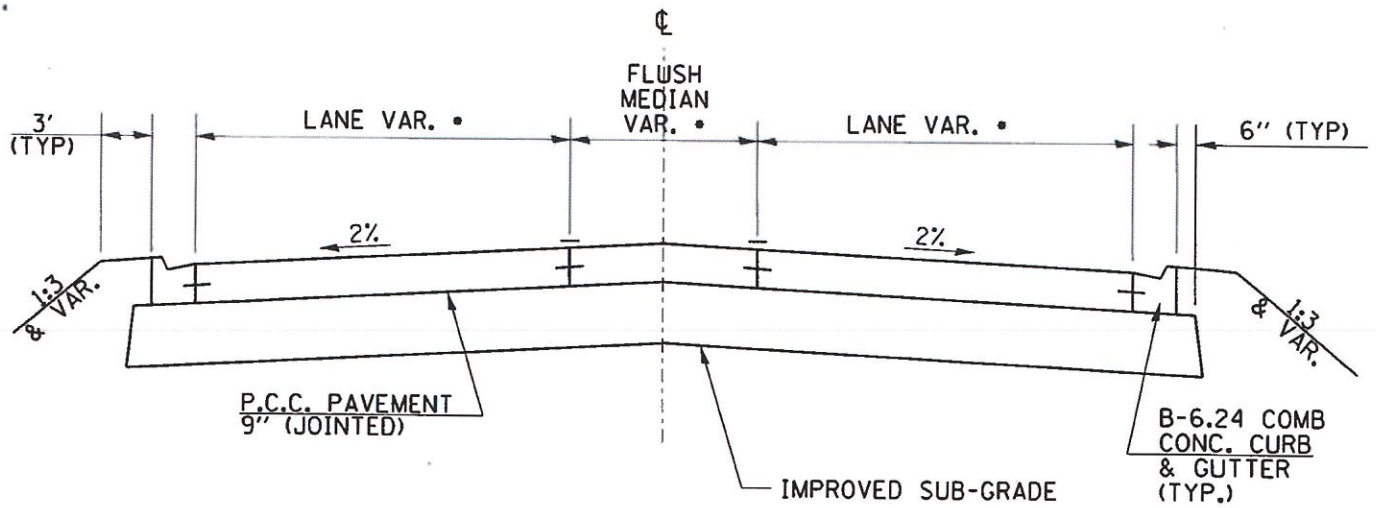
SEC. NO. 31(IN) PROJ. NO. 66852
SCALE 1:50 COUNTY LASALLE
SIN: REV. NO.

DESIGNED BY SCOTT A FERGUSON DATE 2/22/2019

SATISFACTORY [Signature] 7/3/19
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SATISFACTORY [Signature] 7/3/19

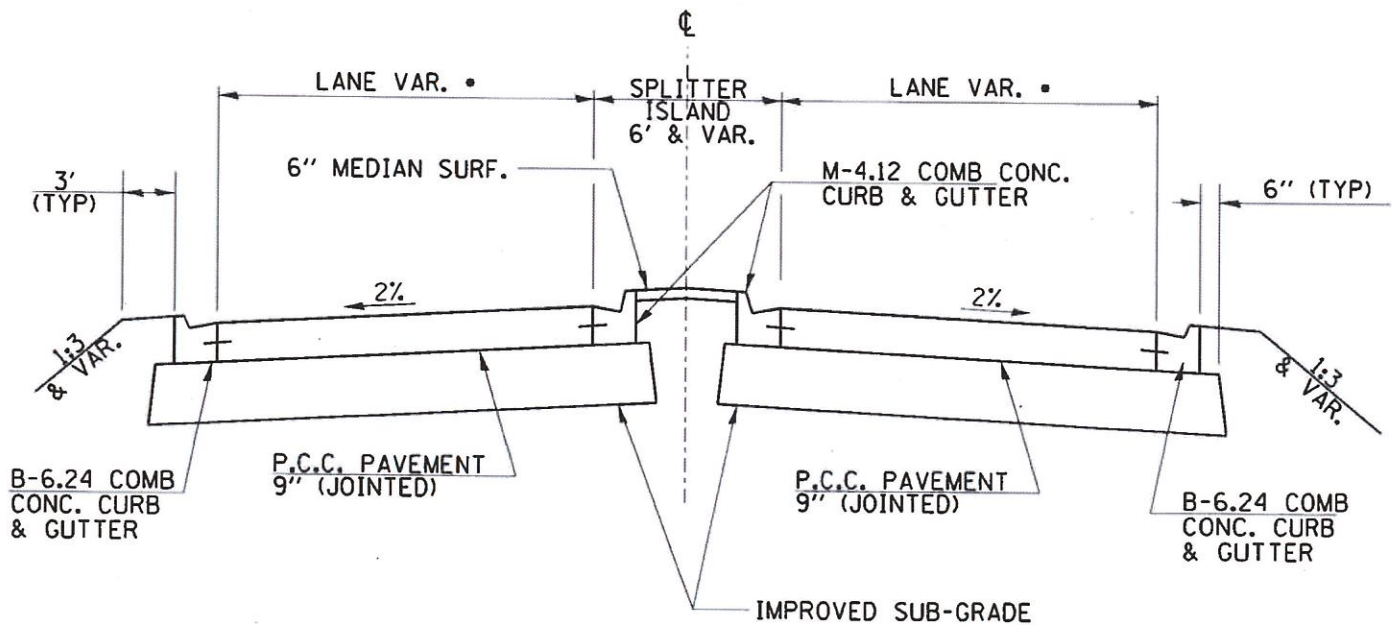
APPROVED [Signature] 7/3/19
REGIONAL ENGINEER

CADD FILE NAME: (D366852) I.D.S. SHEET 1 OF 9



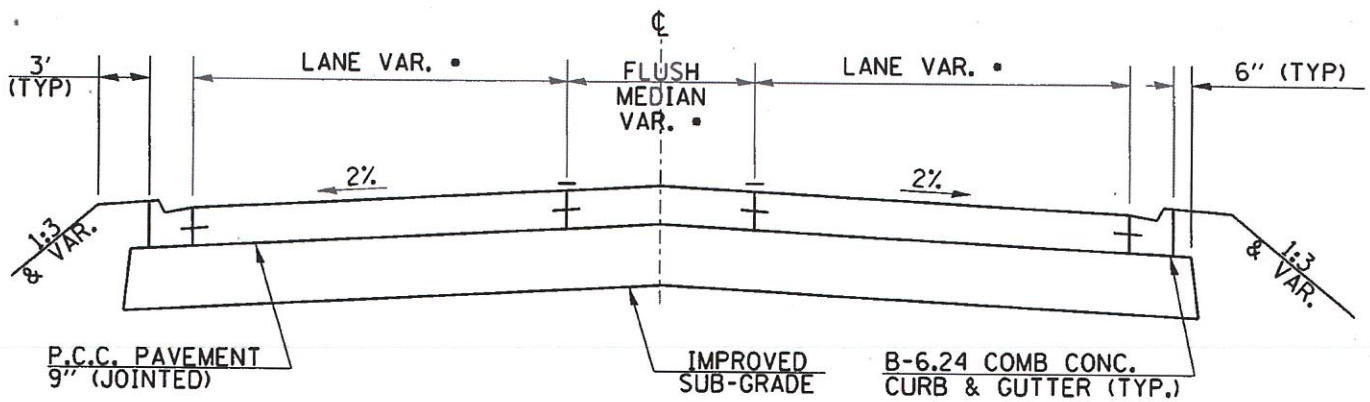
• LANE AND MEDIAN WIDTHS VARY
THROUGHOUT - SEE PLANS

STA. 278 + 25 TO STA. 281 + 40
STA. 286 + 03 TO STA. 286 + 50



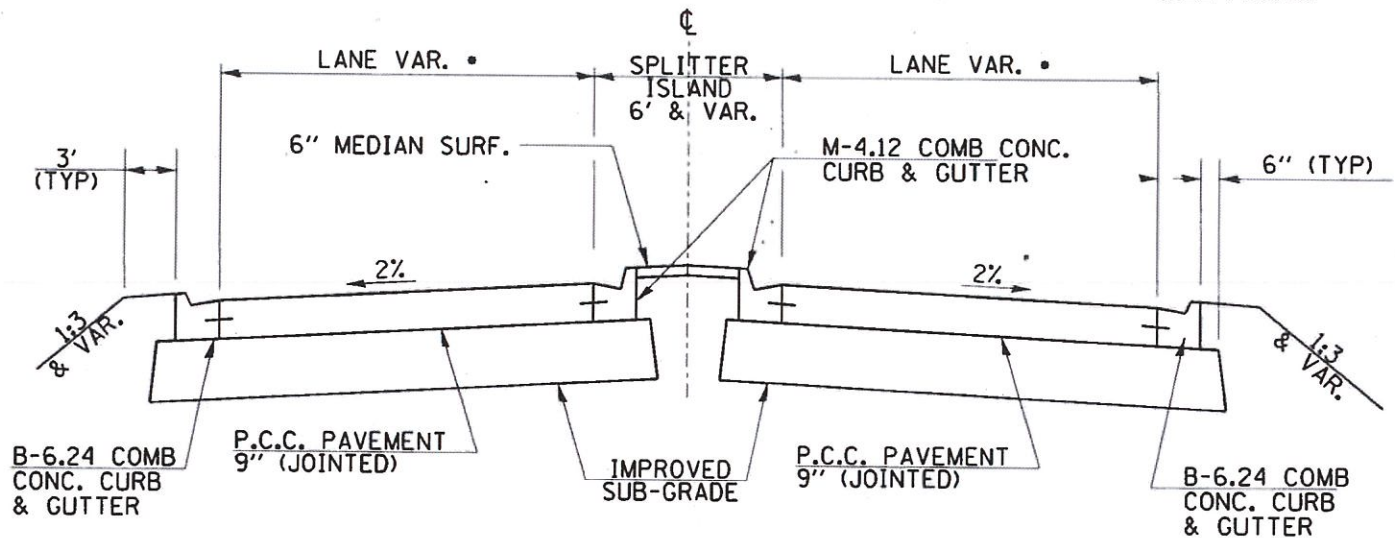
• LANE AND MEDIAN WIDTHS VARY
THROUGHOUT - SEE PLANS

STA. 281 + 40 TO STA. 282 + 11
STA. 283 + 49 TO STA. 286 + 03

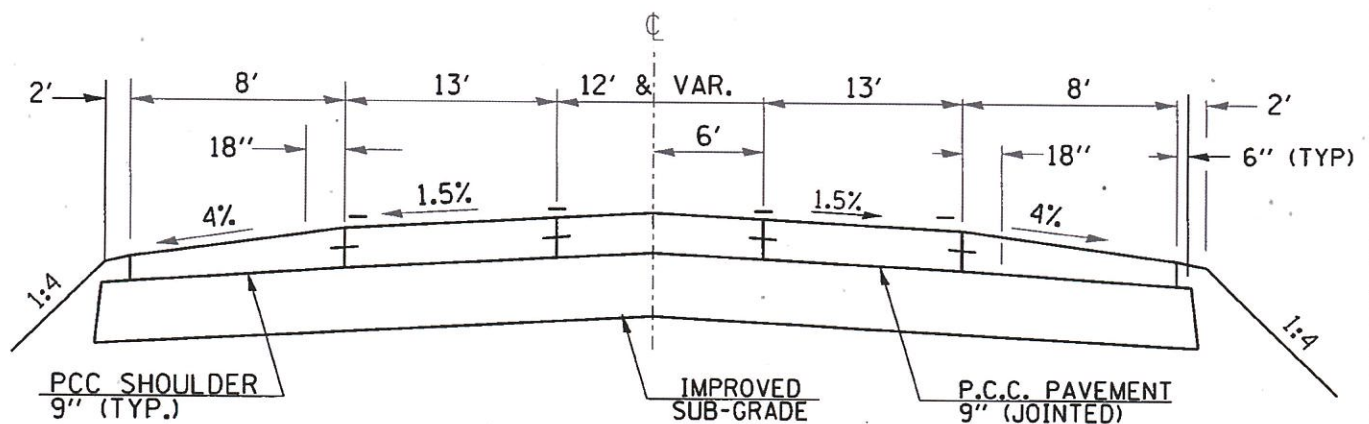


STA. 88+00 TO STA. 88+80
STA. 91+94 TO STA. 92+67.5

• LANE AND MEDIAN WIDTHS VARY (SEE PLANS)

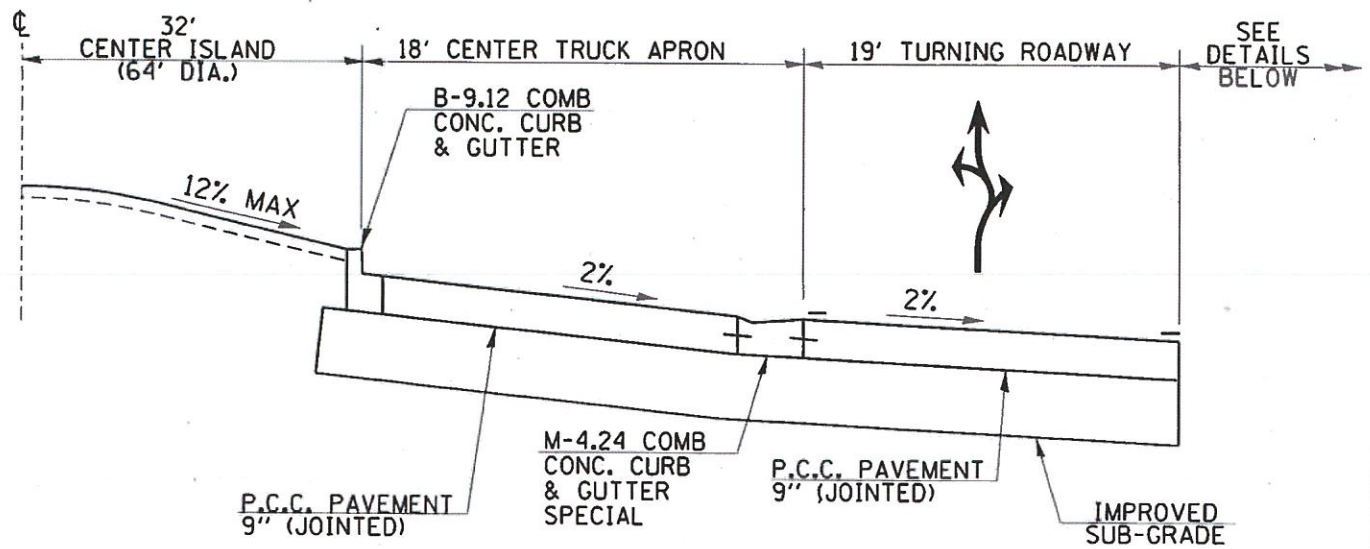


STA. 88+80 TO STA. 89+59.15
STA. 90+97.15 TO STA. 91+94

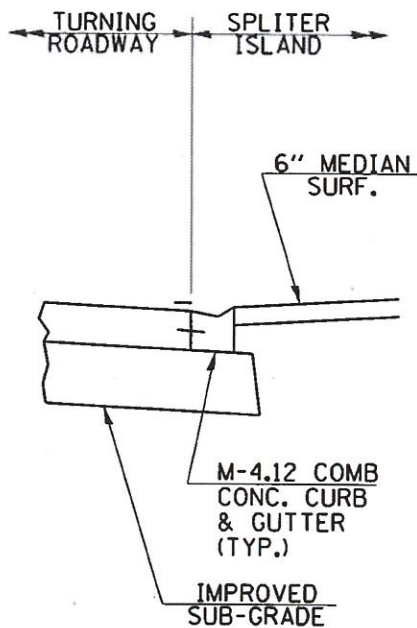


STA. 92+67.5 TO STA. 96+00

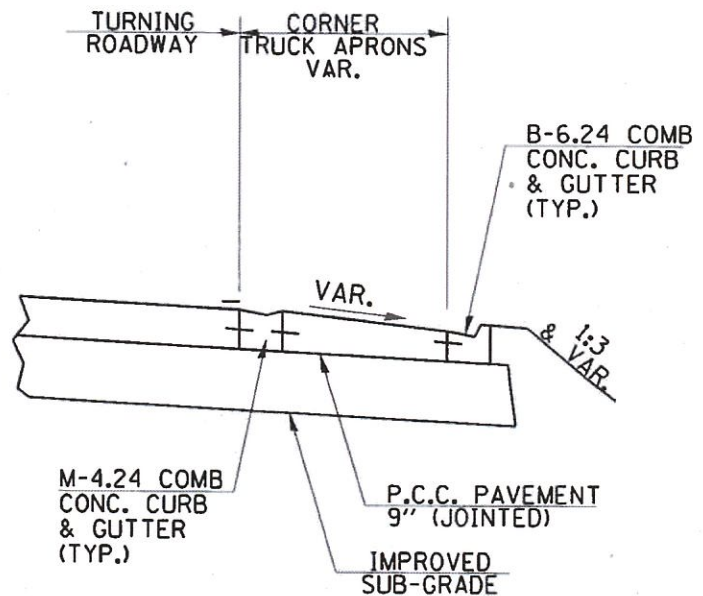
PROPOSED TYPICAL SECTIONS - IL 178



CENTER ISLAND AND TURNING ROADWAY



SPLITTER ISLAND DETAIL



CORNER APRON DETAIL

IDOT MECHANISTIC PAVEMENT DESIGN

Printed: 01/07/2020

PROJECT AND TRAFFIC INPUTS

(Enter Data in Gray Shaded Cells)

Route: US 6
 Section: (31)N
 County: LaSalle
 Location: IL 178 Intersection with US 6

Comments: North Utica Roundabout

Using Traffic MEMO 1/18/2017 for US 6 Traffic Data

Design Date: 11/25/2019

Modify Date:

<-- BY

<-- BY

	ADT	Year
Current:	5,460	2020
Future:	6,510	2040

Facility Type: Other Marked State Route

of Lanes = 2 or 3

Part of future 4 lanes or more? No

One Way Street? No

Road Class: II

Subgrade Support Rating (SSR): Poor

Construction Year: 2022

Design Period (DP) = 20 years

Structural Design Traffic

	Minimum ADT	Actual ADT	Actual % of Total ADT	% of ADT in Design Lane
PV =	0	5,396	88.6%	P = 50%
SU =	250	262	4.3%	S = 50%
MU =	750	432	7.1%	M = 50%
Struct. Design ADT =	6,090	(2032)		

TRAFFIC FACTOR CALCULATION

FLEXIBLE PAVEMENT

Cpv = 0.15

Csu = 112.06

Cmu = 385.44

TF flexible (Actual) = 1.97 (Actual ADT)

TF flexible (Min) = 3.17 (Min ADT Fig. 54-2.C)

RIGID PAVEMENT

Cpv = 0.15

Csu = 135.78

Cmu = 567.21

TF rigid (Actual) = 2.82 (Actual ADT)

TF rigid (Min) = 4.59 (Min ADT Fig. 54-2.C)

NEW CONSTRUCTION / RECONSTRUCTION PAVEMENT DESIGN CALCULATIONS

Full-Depth HMA Pavement

Use TF flexible = 3.17

PG Grade Lower Binder Lifts = PG 64-22 (Fig. 53-4.O)

HMA Mixture Temp. = 75.5 deg. F (Fig. 54-5.C)

Design HMA Mixture Modulus (E_{HMA}) = 680 ksi (Fig. 54-5.D)Design HMA Strain (ϵ_{HMA}) = 86 (Fig. 54-5.E)

Full Depth HMA Design Thickness = 10.00 in. (Fig. 54-5.F)

Limiting Strain Criterion Thickness = 15.00 in. (Fig. 54-5.I)

Use Full-Depth HMA Thickness = 10.00 inches

JPC Pavement

Use TF rigid = 4.59

Edge Support = Tied Shoulder or C&G

Rigid Pavt Thick. = 9.00 in. (Fig. 54-4.E)

CRC Pavement

Use TF rigid = 4.59

IBR value = 3

CRCP Thickness = 7.75 in. (Fig. 54-4.N)

TF MUST BE > 60 FOR CRCP

RECONSTRUCTION ONLY (SUPPLEMENTAL) PAVEMENT DESIGN CALCULATIONS

HMA Pavement Over Rubblized PCC

Use TF flexible = 3.17

HMA Overlay Design Thickness = 7.50 in. (Fig. 54-5.U)

Limiting Strain Criterion Thickness = 11.00 in. (Fig. 54-5.V)

Use HMA Overlay Thickness = 7.50 inches

Unbonded Concrete Overlay

Review 54-4.03 for limitations and special considerations.

JPCP Thickness = NA inches

CONTACT RESEARCH FOR ASSISTANCE

DESIGN TABLES FROM BDE MANUAL CHAPTER 54 - PAVEMENT DESIGN

Class I Roads	Class II Roads	Class III Roads	Class IV Roads
4 lanes or more Part of a future 4 lanes or more One-way Streets with ADT > 3500	2 lanes with ADT > 2000 One way Street with ADT <= 3500	2 Lanes (ADT 750 -2000)	2 Lanes (ADT < 750)

Facility Type	Min. Str. Design Traffic (Fig 54-2.C)		
	PV	SU	MU
Interstate or Freeway	0	500	1500
Other Marked State Route	0	250	750
Unmarked State Route	No Min	No Min	No Min

Class Table for One-Way Streets	
ADT	Class
0 - 3500	II
>3501	I

Class	Traffic Factor ESAL Coefficients			
	Rigid (Fig. 54-4.C)		Flexible (Fig. 54-5.B)	
	Csu	Cmu	Csu	Cmu
I	143.81	696.42	132.50	482.53
II	135.78	567.21	112.06	385.44
III	129.58	562.47	109.14	384.35
IV	129.58	562.47	109.14	384.35

Class Table for 2 or 3 lanes (not future 4 lane & not one-way street)	
ADT	Class
0 - 749	IV
750 - 2000	III
>2000	II

Number of Lanes	Design Lane Distribution Factors For Structural Design Traffic (Fig. 54-2.B)					
	Rural			Urban		
	P	S	M	P	S	M
1 Lane Ramp	100%	100%	100%	100%	100%	100%
2 or 3	50%	50%	50%	50%	50%	50%
4	32%	45%	45%	32%	45%	45%
6 or more	20%	40%	40%	8%	37%	37%

FULL-DEPTH HMA PAVEMENT

Standard Design

ROUTE US 6
SECTION (31)N
COUNTY LaSalle
LOCATION IL 178 intersection with US 6

FACILITY TYPE NON-INTERSTATE

PROJECT LENGTH 1561 FT ==> 0.30 Miles
OF CENTERLINES 1 CL
OF LANES 2 LANES
OF EDGES 2 EP
LANE WIDTH - AVERAGE 20 FT
SHOULDER WIDTH HMA Left 0 FT
HMA Right 0 FT
Total Width of Paved Shoulders 0 FT

PAVEMENT THICKNESS (FLEXIBLE) 10.00 IN 15.00 IN MAX
SHOULDER THICKNESS 8.00 IN HMA_SD Standard Design
HMA OVERLAY THICKNESS 2.00 IN

FLEX PAVEMENT TRAFFIC FACTORS MINIMUM 3.17 ACTUAL 1.97 USE 3.17

HMA COST PER TON UNIT PRICE
HMA SURFACE \$135.00 / TON
HMA TOP BINDER \$96.50 / TON
HMA LOWER BINDER \$84.45 / TON
HMA BINDER (IL-9.5FG or IL-4.75) \$85.00 / TON
HMA SHOULDER \$91.64 / TON

INITIAL COSTS ITEM	THICKNESS	100% QUANTITY	UNIT PRICE	COST
HMA PAVEMENT (FULL-DEPTH)	(10.00")	6787	6,787 SQ YD *	\$55.50 / SQ YD \$0
HMA SURFACE COURSE	(2.00")	1.0042	760 TONS *	\$100.84 / TON \$76,638 ~
HMA TOP BINDER COURSE	(2.25")	1.0130	855 TONS *	\$92.17 / TON \$78,805 ~
HMA LOWER BINDER COURSE	(5.75")	1.0297	2,185 TONS *	\$84.45 / TON \$184,523 ~
HMA SHOULDER	(8.00")	615	615 SQ YD *	\$66.52 / SQ YD \$40,910 ~
CURB & GUTTER			4,413 LIN FT *	\$28.50 / LIN FT \$125,771
SUBBASE GRAN MATL TY C (TONS)			0 TONS *	\$45.59 / TON \$0
IMPROVED SUBGRADE:	Modified Soil Width = 48.1	8,340	8,340 SQ YD *	\$16.00 / SQ YD \$133,440
Reserved For User Supplied Item			0 UNITS	\$0.00 / UNITS \$0
Reserved For User Supplied Item			0 UNITS	\$0.00 / UNITS \$0
PAVEMENT REMOVAL			0 SQ YD *	\$15.00 / SQ YD \$0
SHOULDER REMOVAL			0 SQ YD *	\$12.50 / SQ YD \$0

Note: * Denotes User Supplied Quantity

FLEXIBLE CONSTRUCTION \$640,087
FLEXIBLE CONSTRUCTION \$88,302

MAINTENANCE COSTS: ITEM	THICKNESS	MATERIAL	UNIT COST
ROUTINE MAINTENANCE ACTIVITY			\$0.00 LANE-MILE / YEAR
HMA OVERLAY PVMT SURF	(2.00")	1.0042 Surface IV 2.00	\$15.18 / SQ YD
HMA OVERLAY PVMT	(2.00")	1.0042 Surface IV 2.00	\$15.18 / SQ YD
HMA SURFACE MIX	(2.00")	1.0042 Surface IV 2.00	\$15.18 / SQ YD
HMA BINDER MIX	(0.00")	1.0083 IL-9.5FG or II 0.00	\$0.00 / SQ YD
HMA OVERLAY SHLD (Year 30)	(2.00")	Shoulder I 2.00	\$10.26 / SQ YD
HMA OVERLAY SHLD	(2.00")	Shoulder I 2.00	\$10.26 / SQ YD
MILLING (2.00 IN)			2.00 \$2.88 / SQ YD
PARTIAL DEPTH PVMT PATCH	(Mill & Fill Surf)	Surface IV 2.00	\$85.00 / SQ YD
PARTIAL DEPTH SHLD PATCH	(Mill & Fill Surf)	Shoulder I 2.00	\$80.14 / SQ YD
PARTIAL DEPTH PVMT PATCH	(Mill & Fill +2.00 ")	Binder Mix 2.00	\$79.40 / SQ YD
PARTIAL DEPTH SHLD PATCH	(Mill & Fill +2.00 ")	Shoulder I 2.00	\$80.14 / SQ YD

LONGITUDINAL SHOULDER JOINT ROUT & SEAL
CENTERLINE JOINT ROUT & SEAL
RANDOM / THERMAL CRACK ROUT & SEAL

(100% Ref

\$3.20 / LIN FT
\$3.20 / LIN FT
\$3.20 / LIN FT

FLEXIBLE TOTAL LIFE- \$858,963
FLEXIBLE TOTAL ANNI \$118,497

PCC PAVEMENT

JPCP

ROUTE
SECTION
COUNTY
LOCATION

US 6
(31)N
LaSalle
IL 178 intersection with US 6

FACILITY TYPE

NON-INTERSTATE

PROJECT LENGTH	1561 FT	= = >	0.30 Miles
# OF CENTERLINES	1 CL		
# OF LANES	2 LANES		
# OF EDGES	2 EP		
LANE WIDTH - AVERAGE	20 FT		
SHOULDER WIDTH	0 FT		
PCC Left	0 FT		
PCC Right	0 FT		
Total Width of Paved Shoulders	0 FT		

PAVEMENT THICKNESS (RIGID)	JPCP	9.00 IN	TIED SHLD
SHOULDER THICKNESS		9.00 IN	

HMA OVERLAY THICKNESS	2.75 IN
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RIGID PAVEMENT TRAFFIC FACTORS	MINIMUM	ACTUAL	USE
	4.59	2.82	4.59
Worksheet Construction Type is	Reconstruction	The Pavement Type is	JPCP

INITIAL COSTS ITEM	THICKNESS	100% QUA UNIT	UNIT PRICE	COST
JPC PAVEMENT	(9.00")	6,787 SQ YD *	\$55.77 / SQ YD	\$378,511
PAVEMENT REINFORCEMENT		0 SQ YD *	\$22.00 / SQ YD	\$0
STABILIZED SUBBASE	(4.00")	0 SQ YD *	\$18.00 / SQ YD	\$0
PCC SHOULDERS	(9.00" to 9.00")	615 SQ YD *	\$55.00 / SQ YD	\$33,825
CURB & GUTTER		4,413 LIN FT *	\$28.50 / LIN FT	\$125,771
SUBBASE GRAN MATL TY C	(~ 0.00")	210 TONS *	\$45.59 / TON	\$9,574
IMPROVED SUBGRADE:	Modified Soil Width = 48.1	8,340 SQ YD *	\$16.00 / SQ YD	\$133,440
Reserved For User Supplied Item		0 UNITS	\$0.00 / UNITS	\$0
PAVEMENT REMOVAL		0 SQ YD *	\$0.00 / SQ YD	\$0
SHOULDER REMOVAL		0 SQ YD *	\$0.00 / SQ YD	\$0

Note: * Denotes User Supplied Quantity

RIGID CONSTRUCTION	\$681,121
RIGID CONSTRUCTION	\$93,963

MAINTENANCE COSTS: ITEM	THICKNESS	MATERIAL	T	UNIT COST
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ROUTINE MAINTENANCE ACTIVITY				\$0.00 / LANE-MILE / YEAR
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HMA OVERLAY	(2.75")		2.75	
HMA OVERLAY PAVEMENT	(2.75")	1.0057	2.75	\$17.38 / SQ YD
HMA SURFACE MIX	(1.50")	1.0031	Surface IV	\$11.38 / SQ YD
HMA BINDER MIX	(1.25")	1.0089	IL-9.5FG or II	\$6.00 / SQ YD
HMA OVERLAY SHOULDER	(2.75")		Shoulder I	\$14.11 / SQ YD

CLASS A PAVEMENT PATCHING				\$195.00 / SQ YD
CLASS B PAVEMENT PATCHING				\$175.00 / SQ YD
CLASS C SHOULDER PATCHING				\$145.00 / SQ YD

PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA Surf)		Surface IV	1.50	\$81.22 / SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA 2.75")		Surface IV	2.75	\$90.67 / SQ YD

LONGITUDINAL SHOULDER JOINT ROUT & SEAL				\$3.20 / LIN FT
CENTERLINE JOINT ROUT & SEAL				\$3.20 / LIN FT
REFLECTIVE TRANSVERSE CRACK ROUT & SEAL				\$3.20 / LIN FT
RANDOM CRACK ROUT & SEAL		(100% Rehab = 100.00' /		\$3.20 / LIN FT

RIGID TOTAL LIFE-C	\$815,593
RIGID TOTAL ANNUAL	\$112,514

LIFE-CYCLE COST ANALYSIS: NEW DESIGN

Calculated / Re: #####

CONSTRUCTION	INITIAL COST	JPCP		HMA
		PRESENT V		
		ANNUAL C	\$681,121	\$640,087
			\$93,963	\$88,302
MAINTENANCE	LIFE-CYCLE COST	PRESENT V	\$134,472	\$218,876
		ANNUAL C	\$18,551	\$30,195
TOTAL	LIFE-CYCLE COST	PRESENT V	\$815,593	\$858,963
		ANNUAL C	\$112,514	\$118,497

LIFE-CYCLE COST ANALYSIS: FINAL SUMMARY

LOWEST COST OPTION	===== JPCP	\$112,514	
OTHER OPTIONS (LOWEST TO HIGHEST):	TYPE / PE HMA	\$118,497	5.3%

HMA_SD

MAINTENANCE AND REHABILITATION ACTIVITY SCHEDULE

03/10/20

FULL-DEPTH HMA PAVEMENT
HMA PAVEMENT OVER RUBBLIZED PCC PAVEMENT
Figure 54-7.C
STANDARD DESIGN

MAINTENANCE ITEM	%	QUANTITY	UNIT	UNIT COST	COST	PRESENT WORTH
YEAR 5						
LONG SHLD JT R&S	100.00%	3,122	LIN FT	\$3.20	\$9,990	
CNTR LINE JOINT R&S	100.00%	1,561	LIN FT	\$3.20	\$4,995	
RNDM / THRM CRACK R&S	50.00%	1,717	LIN FT	\$3.20	\$5,494	
PD PVMT PATCH M&F SURF	0.10%	7	SQ YD	\$85.00	\$595	
PWF _n =	0.8626		PW =	0.8626 X	\$21,074	\$18,179
YEAR 10						
LONG SHLD JT R&S	100.00%	3,122	LIN FT	\$3.20	\$9,990	
CNTR LINE JOINT R&S	100.00%	1,561	LIN FT	\$3.20	\$4,995	
RNDM / THRM CRACK R&S	50.00%	1,717	LIN FT	\$3.20	\$5,494	
PD PVMT PATCH M&F SURF	0.50%	34	SQ YD	\$85.00	\$2,890	
PWF _n =	0.7441		PW =	0.7441 X	\$23,369	\$17,389
YEAR 15						
MILL PVMT & SHLD 2.00"	100.00%	7,402	SQ YD	\$2.88	\$21,318	
PD PVMT PATCH M&F ADD'L 2.00"	1.00%	68	SQ YD	\$79.40	\$5,399	
HMA OVERLAY PVMT 2.00"	100.00%	6,787	SQ YD	\$15.18	\$103,047	
HMA OVERLAY SHLD 2.00 "	100.00%	615	SQ YD	\$10.26	\$6,312	
PWF _n =	0.6419		PW =	0.6419 X	\$136,076	\$87,342
YEAR 20						
LONG SHLD JT R&S	100.00%	3,122	LIN FT	\$3.20	\$9,990	
CNTR LINE JOINT R&S	100.00%	1,561	LIN FT	\$3.20	\$4,995	
RNDM / THRM CRACK R&S	50.00%	1,717	LIN FT	\$3.20	\$5,494	
PD PVMT PATCH M&F SURF	0.10%	7	SQ YD	\$85.00	\$595	
PWF _n =	0.5537		PW =	0.5537 X	\$21,074	\$11,668
YEAR 25						
LONG SHLD JT R&S	100.00%	3,122	LIN FT	\$3.20	\$9,990	
CNTR LINE JOINT R&S	100.00%	1,561	LIN FT	\$3.20	\$4,995	
RNDM / THRM CRACK R&S	50.00%	1,717	LIN FT	\$3.20	\$5,494	
PD PVMT PATCH M&F SURF	0.50%	34	SQ YD	\$85.00	\$2,890	
PWF _n =	0.4776		PW =	0.4776 X	\$23,369	\$11,161
YEAR 30						
NON-INTERSTATE						
MILL PVMT & SHLD 2.00"	100.00%	7,402	SQ YD	\$2.88	\$21,318	
PD PVMT PATCH M&F ADD'L 2.00"	2.00%	136	SQ YD	\$79.40	\$10,798	
PD SHLD PATCH M&F ADD'L 2.00"	1.00%	6	SQ YD	\$80.14	\$481	
HMA OVERLAY PVMT 2.00 "	100.00%	6,787	SQ YD	\$15.18	\$103,047	
HMA OVERLAY SHLD 2.00 "	100.00%	615	SQ YD	\$10.26	\$6,312	
PWF _n =	0.4120		PW =	0.4120 X	\$141,956	\$58,484
YEAR 35						
LONG SHLD JT R&S	100.00%	3,122	LIN FT	\$3.20	\$9,990	
CNTR LINE JOINT R&S	100.00%	1,561	LIN FT	\$3.20	\$4,995	
RNDM / THRM CRACK R&S	50.00%	1,717	LIN FT	\$3.20	\$5,494	
PD PVMT PATCH M&F SURF	0.10%	7	SQ YD	\$85.00	\$595	
PWF _n =	0.3554		PW =	0.3554 X	\$21,074	\$7,489
YEAR 40						
LONG SHLD JT R&S	100.00%	3,122	LIN FT	\$3.20	\$9,990	
CNTR LINE JOINT R&S	100.00%	1,561	LIN FT	\$3.20	\$4,995	
RNDM / THRM CRACK R&S	50.00%	1,717	LIN FT	\$3.20	\$5,494	
PD PVMT PATCH M&F SURF	0.50%	34	SQ YD	\$85.00	\$2,890	
PWF _n =	0.3066		PW =	0.3066 X	\$23,369	\$7,164
						\$218,876
ROUTINE MAINTENANCE ACTIVITY		0.59	Lane Miles	0.00	\$0	\$0
45 YEAR LIFE CYCLE	CRF _n = 0.0407852				MAINTENANCE	\$218,876
					MAINTENANCE	\$30,195

JOINTED PLAIN CONCRETE PAVEMENT
UNBONDED JOINTED PLAIN CONCRETE OVERLAY
Figure 54-7.A

MAINTENANCE ITEM	%	QUANTITY	UNIT	UNIT COST	COST	PRESENT WORTH
YEAR 10						
PAVEMENT PATCH CLASS B	0.10%	7	SQ YD	\$175.00	\$1,225	
PWF _n =	0.7441		PW =	0.7441 X	\$1,225	\$912
YEAR 15						
PAVEMENT PATCH CLASS B	0.20%	14	SQ YD	\$175.00	\$2,450	
PWF _n =	0.6419		PW =	0.6419 X	\$2,450	\$1,573
YEAR 20						
PAVEMENT PATCH CLASS B	2.00%	136	SQ YD	\$175.00	\$23,800	
SHOULDER PATCH CLASS C	0.50%	3	SQ YD	\$145.00	\$435	
LONGITUDINAL SHLD JT R&S	100.00%	3,122	LIN FT	\$3.20	\$9,990	
CENTERLINE JT R&S	100.00%	1,561	LIN FT	\$3.20	\$4,995	
PWF _n =	0.5537		PW =	0.5537 X	\$39,220	\$21,715
YEAR 25						
PAVEMENT PATCH CLASS B	3.00%	204	SQ YD	\$175.00	\$35,700	
SHOULDER PATCH CLASS C	1.00%	6	SQ YD	\$145.00	\$870	
PWF _n =	0.4776		PW =	0.4776 X	\$36,570	\$17,466
YEAR 30						
NON-INTERSTATE						
PAVEMENT PATCH CLASS B	4.00%	271	SQ YD	\$175.00	\$47,425	
SHOULDER PATCH CLASS C	1.50%	9	SQ YD	\$145.00	\$1,305	
HMA OVERLAY 2.75" (PVMT)	100.00%	6,787	SQ YD	\$17.38	\$117,945	
HMA OVERLAY 2.75" (SHLD)	100.00%	615	SQ YD	\$14.11	\$8,679	
PWF _n =	0.4120		PW =	0.4120 X	\$175,354	\$72,244
YEAR 35						
NON-INTERSTATE						
LONGITUDINAL SHLD JT R&S	100.00%	3,122	LIN FT	\$3.20	\$9,990	
CENTERLINE JT R&S	100.00%	1,561	LIN FT	\$3.20	\$4,995	
RANDOM CRACK R&S	50.00%	1,561	LIN FT	\$3.20	\$4,995	
REFLECTIVE TRANSVERSE CRACK R&S	40.00%	1,664	LIN FT	\$3.20	\$5,325	
PD PVMT PATCH M&F HMA 2.75"	0.10%	7	SQ YD	\$90.67	\$635	
PWF _n =	0.3554		PW =	0.3554 X	\$25,940	\$9,219
YEAR 40						
NON-INTERSTATE						
PAVEMENT PATCH CLASS B	0.50%	34	SQ YD	\$175.00	\$5,950	
LONGITUDINAL SHLD JT R&S	100.00%	3,122	LIN FT	\$3.20	\$9,990	
CENTERLINE JT R&S	100.00%	1,561	LIN FT	\$3.20	\$4,995	
REFLECTIVE TRANSVERSE CRACK R&S	60.00%	2,496	LIN FT	\$3.20	\$7,987	
RANDOM CRACK R&S	50.00%	1,561	LIN FT	\$3.20	\$4,995	
PD PVMT PATCH M&F HMA 2.75"	0.50%	34	SQ YD	\$90.67	\$3,083	
PWF _n =	0.3066		PW =	0.3066 X	\$37,000	\$11,343
						\$134,472
ROUTINE MAINTENANCE ACTIVITY		0.59	Lane Miles	\$0.00	\$0	\$0
45 YEAR LIFE CYCLE	CRF _n = 0.0407852				MAINTENANCE	\$134,472
					MAINTENANCE	\$18,551